



TITLE:

## Cover & Contents

AUTHOR(S):

---

CITATION:

Cover & Contents. 数理解析研究所講究録別冊 2008, B10

ISSUE DATE:

2008-11

URL:

<http://hdl.handle.net/2433/176768>

RIGHT:

**RIMS Kôkyûroku Bessatsu B10**

**Differential Equations  
and Exact WKB Analysis**

November, 2008

Research Institute for Mathematical Sciences  
Kyoto University

*RIMS Kôkyûroku Bessatsu B10*

*Differential Equations  
and  
Exact WKB Analysis*

*November, 2008*

*Research Institute for Mathematical Sciences*

*Kyoto University, Kyoto, Japan*

The papers presented in this volume of RIMS Kôkyûroku Bessatsu are in final form and refereed.  
©2008 by the Research Institute for Mathematical Sciences, Kyoto University. All rights reserved.  
Printed in Japan.

## PREFACE

This volume of RIMS Kôkyûroku Bessatsu is collecting several research papers and survey articles contributed by invited speakers of the RIMS Conference

### **“Differential Equations and Exact WKB Analysis”**

which was held at RIMS (Research Institute for Mathematical Sciences), Kyoto University from October 9 (Tuesday) through October 12 (Friday) in 2007.

Exact WKB analysis is a powerful tool to explore the global structure of solutions of singularly perturbed ordinary differential equations. It has also a close relationship with microlocal analysis through Borel-Laplace transformations. At the Conference 18 lectures by 15 specialists were given in the above two and related fields such as Painlevé equations, Hamiltonian systems, index theory etc. I hope this volume, which contains 12 contributions of the invited speakers, may promote the progress of the researches in these fields.

The Conference was supported by RIMS. As usual, I would like to express my sincerest gratitude to the secretary staffs of RIMS.

Kyoto in November, 2008

Yoshitsugu TAKEI  
RIMS, Kyoto University

## PROGRAM

### Differential Equations and Exact WKB Analysis

October 9 (Tue) – October 12 (Fri), 2007

Lecture Hall (Room No. 420) of RIMS, Kyoto University

#### October 9, Tuesday

- 14:00 – 15:00 Naofumi HONDA (Hokkaido Univ)  
The geometric structure of virtual turning points, I
- 15:15 – 16:15 Yutaka MATSUI (Univ of Tokyo)  
Kiyoshi TAKEUCHI (Univ of Tsukuba)  
Microlocal study of Lefschetz fixed point formulas
- 16:30 – 17:30 Setsuro FUJIE (Univ of Hyogo)  
Propagation of microlocal solutions at a hyperbolic fixed point

#### October 10, Wednesday

- 10:00 – 11:00 Naofumi HONDA (Hokkaido Univ)  
The geometric structure of virtual turning points, II
- 11:15 – 12:15 Masafumi YOSHINO (Hiroshima Univ)  
Analytic non-integrable Hamiltonian systems and monodromy property
- 14:00 – 15:00 Hidekazu ITO (Kanazawa Univ)  
Birkhoff normal forms for superintegrable systems
- 15:15 – 16:15 Chisato IWASAKI (Univ of Hyogo)  
Construction of the fundamental solution and curvature of manifolds
- 16:30 – 17:30 Michael RUZHANSKY (Imperial College London)  
Strichartz estimates for hyperbolic equations

**October 11, Thursday**

- 10:00 – 11:00 Takashi AOKI (Kinki Univ)  
 Takahiro KAWAI (RIMS, Kyoto Univ)  
 Yoshitsugu TAKEI (RIMS, Kyoto Univ)  
 The Bender-Wu analysis and the Voros theory (Part 2), I
- 11:15 – 12:15 Masa-Hiko SAITO (Kobe Univ)  
 Algebro-geometric constructions of phase spaces, Riemann-Hilbert correspondences and Painlevé property
- 14:00 – 15:00 Katsunori IWASAKI (Kyushu Univ)  
 Takato UEHARA (Kyushu Univ)  
 Area-preserving surface dynamics and S. Saito's fixed point formula
- 15:15 – 16:15 Yoshikatsu SASAKI (Univ of Tokyo)  
 Value distribution of meromorphic solutions to a higher order analogue of the Painlevé equation
- 16:30 – 17:30 Seiji NISHIOKA (Univ of Tokyo)  
 Difference algebra associated to the  $q$ -Painlevé equation of type  $A_7^{(1)}$

**October 12, Friday**

- 10:00 – 11:00 Masaki KASHIWARA (RIMS, Kyoto Univ)  
 Quantization of symplectic manifolds and rational Cherednik algebras
- 11:15 – 12:15 Louis BOUTET DE MONVEL (Univ de Paris 6)  
 Asymptotic equivariant index of Toeplitz operators, and Atiyah-Weinstein conjecture, I
- 14:00 – 15:00 Louis BOUTET DE MONVEL (Univ de Paris 6)  
 Asymptotic equivariant index of Toeplitz operators, and Atiyah-Weinstein conjecture, II
- 15:15 – 16:15 Takashi AOKI (Kinki Univ)  
 Takahiro KAWAI (RIMS, Kyoto Univ)  
 Yoshitsugu TAKEI (RIMS, Kyoto Univ)  
 The Bender-Wu analysis and the Voros theory (Part 2), II
- 16:30 – 17:30 Masaki HIBINO (Okayama Univ of Science)  
 Summability of formal solutions for singular first order linear PDEs with holomorphic coefficients

## LIST OF PARTICIPANTS

Takashi AOKI	Kinki University
Louis BOUTET DE MONVEL	Université de Paris 6
Yasuo CHIBA	Ibaraki University
Setsuro FUJIE	University of Hyogo
Keiko FUJITA	Saga University
Kenro FURUTANI	Tokyo University of Science
Masaki HIBINO	Okayama University of Science
Nariyoshi HIDA	Kyushu University
Sampei HIROSE	RIMS, Kyoto University
Naofumi HONDA	Hokkaido University
Toshihiko HOSHIRO	University of Hyogo
Yu ICHINO	Kyoto University
Hidekazu ITO	Kanazawa University
Chisato IWASAKI	University of Hyogo
Katsunori IWASAKI	Kyushu University
Tomoyuki KAKEHI	University of Tsukuba
Kazuo KANEKO	Kyoto University
Takahiro KAWAI	RIMS, Kyoto University
Hironobu KIMURA	Kumamoto University
Takeshi KURA	Hiroshima University
Akiyoshi MARUYAMA	Kyushu University
Yutaka MATSUI	University of Tokyo
Atusi MATUMIYA	Akashi National College of Technology
Takao MATUMOTO	Hiroshima University
Masatake MIYAKE	Nagoya University

Seiji NISHIOKA	University of Tokyo
Yujiro OHYA	Kyoto University (emeritus)
Yousuke OHYAMA	Osaka University
Yasunori OKADA	Chiba University
Sunao OUCHI	Sophia University
Michael RUZHANSKY	Imperial College London
Masa-Hiko SAITO	Kobe University
Yoshikatsu SASAKI	University of Tokyo
Akira SHUDO	Tokyo Metropolitan University
Mitsuru SUGIMOTO	Osaka University
Hidetoshi TAHARA	Sophia University
Yoshitsugu TAKEI	RIMS, Kyoto University
Shunsuke TSUCHIOKA	RIMS, Kyoto University
Motoo UCHIDA	Osaka University
Koichi UCHIYAMA	Sophia University
Takato UEHARA	Kyushu University
Youko UMETA	Hokkaido University
Seiichiro WAKABAYASHI	University of Tsukuba
Takuya WATANABE	University of Hyogo
Hiroshi YAMAZAWA	Caritas Junior College
Kana YANAI	Ochanomizu University
Masafumi YOSHINO	Hiroshima University



# CONTENTS

	page
PREFACE .....	i
PROGRAM .....	ii
LIST OF PARTICIPANTS .....	iv
ARTICLES	
1. Jean-François BONY, Setsuro FUJIIÉ, Thierry RAMOND and Maher ZERZ- ERI, Propagation of microlocal solutions through a hyperbolic fixed point .....	1
2. Louis BOUTET DE MONVEL, Asymptotic equivariant index of Toeplitz operators .....	33
3. Masaki HIBINO, Summability of formal solutions for singular first-order linear PDEs with holomorphic coefficients .....	47
4. Naofumi HONDA, The geometric structure of a virtual turning point and the model of the Stokes geometry .....	63
5. Hidekazu ITO, Birkhoff normal forms for superintegrable systems ....	115
6. Chisato IWASAKI, Construction of the fundamental solution and curva- ture of manifolds .....	133
7. Yutaka MATSUI and Kiyoshi TAKEUCHI, $A$ -discriminants and Euler obstructions of toric varieties .....	149
8. Seiji NISHIOKA, Difference algebra associated to the $q$ -Painlevé equation of type $A_7^{(1)}$ .....	167
9. Michael RUZHANSKY, On Strichartz estimates for hyperbolic equations with constant coefficients .....	177
10. Yoshikatsu SASAKI, Lower estimates of growth order for the second Painlevé transcendents of higher order .....	191

11. Yoshitsugu TAKEI, Sato's conjecture for the Weber equation and transformation theory for Schrödinger equations with a merging pair of turning points ..... 205
12. Masafumi YOSHINO, Analytic-Liouville-nonintegrable Hamiltonian systems ..... 225